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Hydrol. Earth Syst. Sci., 13, 923-933, 2009  
[www.hydrol-earth-syst-sci.net/13/923/2009/](http://www.hydrol-earth-syst-sci.net/13/923/2009/)

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## Comparison of empirical models with intensively observed data for prediction of salt intrusion in the Sumjin River estuary, Korea

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**Abstract.** Performance of empirical models has been compared with extensively observed data to determine the most suitable model for prediction of salt intrusion in the Sumjin River estuary, Korea. Intensive measurements of salt intrusion were taken at high and low waters during both spring and neap tide in each season from August 2004 to April 2007. The stratification parameter varied with the distance along the estuary, tidal period and freshwater discharge, indicating that the Sumjin River estuary experiences a transition from partially- or well-mixed during spring tide to stratified during neap tide. The salt intrusion length at high water varied from 13.4 km in summer 2005 to 25.6 km in autumn 2006. The salt intrusion mostly depends on the freshwater discharge rather than spring-neap tidal oscillation. Analysis of three years observed salinity data indicates that the scale of the salt intrusion length in the Sumjin River estuary is proportional to the river discharge to the  $-1/5$  power. Four empirical models have been applied to the Sumjin River estuary to explore the most suitable model for prediction of the salt intrusion length. Comparative results show that the Nguyen and Savenije (2006) model, developed under both partially- and well-mixed estuaries, performs best of all models studied (relative error of 4.6%). The model was also applied under stratified neap tide conditions, with a relative error of 5.2%, implying applicability of this model under stratified conditions as well.

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